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ARMY NATIONAL GUARD: AN EMPIRICAL ANALYSIS

David W. Grissmer
Sheila Nataraj Kirby

March 1985
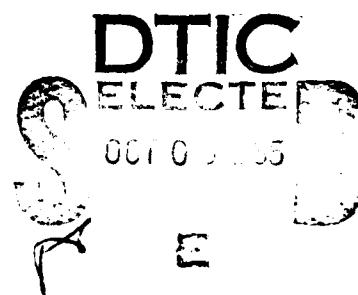
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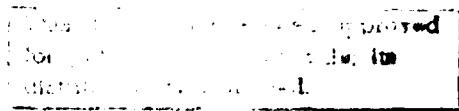
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ATTRITION AND RETENTION IN THE ARMY RESERVE AND ARMY NATIONAL GUARD: AN EMPIRICAL ANALYSIS

David W. Grissmer
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Following the termination of the draft in January 1973, the number of Reserve enlisted personnel declined precipitously for four successive years. The decline, from a high of 919,000 in FY73 to a low of 788,000 by FY78, was almost entirely due to the decline in the Army components (Army Selected Reserve and Army National Guard), and raised serious concerns about the viability of the Army Selected Reserve in the All-Volunteer Force (AVF). One hypothesis about the decline was that pay increases--the principal mechanism recommended by the Gates Commission to sustain the AVF--were not having their predicted effect for the Reserves. One of the major transition problems for the Reserves was the absence of research[1] on effects of pay increases on reserve enlistment and retention, and accurate estimates of the natural rise in retention rates due to the presence of volunteer rather than draft-motivated enlistees. Partly due to this research gap, the Gates Commission did not tailor separate policies for the Active and Reserve forces in the AVF. Instead, they pointed out that Reserve initiatives may well be inadequate and additional pay increases may be necessary.[2]

This paper reports on retention and attrition research subsequently undertaken to help fill this gap. The research reported here draws on two disparate analyses. The first is an evaluation of the 1978 Selected Reserve Reenlistment Bonus Test undertaken in response to a 1977 congressional authorization. This test focuses on the influence of pay and other factors on the Reserve reenlistment decision. The second analyzes attrition behavior of nonprior service reservists who separate from the Reserves prior to completion of their enlisted term. The Gates Commission failed to anticipate the rise in first term attrition during the AVF for both Active and Reserves. This increase in

attrition raised accession requirements. Recognition of this effect would probably have resulted in a recommendation to increase levels of pay beyond the original recommended increases and presumably could have forestalled some of the decline.

Section I focuses on the reserve reenlistment decision while Section II centers on the attrition decision. Each is divided into several subsections describing the data base, the theoretical framework for the analysis, and the empirical results. Section III presents concluding remarks.

I. THE RESERVE REENLISTMENT DECISION

In the fall of 1977, Congress appropriated $5 million to test reenlistment bonuses in the Army National Guard and Army Reserve. The authorization bill specified not only the total test authorization, but also the amount, form, and timing of bonus payments to be tested, and the eligibility requirements for bonus recipients. Bonuses of $1,800 were offered for a 6-year reenlistment and $900 for a 3-year reenlistment, one-half to be paid at the time of reenlistment and the remaining amount in $150 installments at the completion of each obligated year of service. A repayment clause obligated a reservist who failed to complete the reenlistment contract to return a portion of the bonus payment. Reservists could extend their commitment for a single year, but were not eligible for a bonus.

The bill specified several further eligibility requirements: only nonprior service (NPS) personnel (that is, personnel who had not served in the active force prior to joining the reserve) with fewer than 8 years of service facing reenlistment decisions between January 1 and December 31, 1978, were eligible. Since nonprior service reservists usually serve an initial 6-year term,[3] the bonus targeted reservists who were making their first reenlistment decision after serving an initial 6-year term or those who completed an initial 6-year term, had reenlisted for 1 year, and were making a second reenlistment decision.

To permit the evaluation of the bonus effect, the test was experimentally designed to include bonus and control regions.[4] Bonuses were offered to National Guardsmen in six states and to reservists in four Army Reserve regions. Each state or region was matched with a

control region on the basis of estimates of past retention behavior and the economic character of the region. The aggregate characteristics of test and control regions were also matched closely to national characteristics so that the results could be extrapolated. Approximately 15,000 reservists in the test and control regions met the eligibility conditions and constituted the experimental sample. Of these, almost 75 percent were in the National Guard.

The reenlistment decision of each reservist in the sample was monitored. These administrative data were combined with demographic and military background information collected from the Reserve Enlisted Master Personnel File. The information from the computerized files was used to control for small differences in the composition of the test and control groups. This data base was used for the bonus test evaluation analysis.

A survey questionnaire was also administered to the 15,000 reservists eligible for the bonus test. This was designed to capture detailed data on civilian labor force status, civilian compensation and hours worked, and family and employer characteristics. The survey record was linked with the corresponding record from the Reserve Enlisted Master Personnel File. A subset of this survey sample was used to estimate a multivariate model of the reenlistment decision which incorporated the information about the primary job.

A. Theoretical Framework for Analyzing Reserve Reenlistment Decisions

Parallels to Reserve participation do not come easily to mind. The Reserve job is similar in some ways to other moonlighting jobs, and also shares some aspects of voluntary activities such as membership in a volunteer fire department or veteran's organization. However, Reserve participation has several characteristics which set it apart from both secondary jobs and voluntary activities.

First, while most reservists are moonlighters, reservists must periodically spend full time on the Reserve job, which may conflict directly with primary job requirements. Annual training requires 14 days of full-time work during the summer. Reservists who have had no active duty experience must initially train full time for at least four months. Advancement may involve specialized, full-time training.

Reserve service may also require full-time duty during threats to national security and call-ups for civil emergencies.

Second, the reservist must legally commit to between one to six years of service, in contrast to most secondary jobs in the civilian economy and volunteer activities.

Third, Reserve participation provides some unusual fringe benefits that sets it apart from other moonlighting jobs. Reservists can obtain health, life insurance, education and tax benefits and may qualify for a cost-of-living-adjusted pension at the age of 60 after 20 years of satisfactory service.[5] Current enlistment education benefits pay for tuition and fees up to a lifetime total of $4,000. Recent legislation will enhance the Reserve education benefit. Reservists also may use post and service exchanges while on annual training.

Fourth, the Reserve job may provide nonpecuniary rewards. The work itself often offers specialized training and a special environment, which may generate feelings of camaraderie and a sense of team accomplishment. Reserve participation seems to provide some of the same kinds of subjective rewards as membership in fraternal or service organizations.

Fifth, the Reserve work schedule differs from the schedules of most moonlighting jobs in its inflexibility with regard to the number of hours worked and the specific times. Reservists are paid for either eight or 16 hours per month, with no opportunity for increasing paid hours. These hours are usually scheduled on weekends, and drill attendance is mandatory. Annual training requires the interruption of full-time civilian employment with little flexibility to satisfy civilian employer scheduling concerns.

Because the Reserve offers limited working hours, it attracts moonlighters (men and women with full-time jobs) rather than those who want to work only part-time. More than 93 percent of the reservists in the 1978 reenlistment bonus test were moonlighting, while less than 7 percent were working only part-time. Reservists work a total of 204 hours a year,[6] much less than the average of 960 hours a year worked by part-time jobholders, or the median of 700 hours a year worked by moonlighters on second jobs.[7]

Although the typical civilian second job offers the moonlighter the opportunity to earn more money through increased work hours, individual tastes and differences in civilian and reserve monetary and nonmonetary benefits may make the Reserve job more attractive.

The theoretical model we developed to analyze the Reserve participation decision had, as its underpinning, the traditional moonlighting labor market theory[8] in which the moonlighting choice is framed in terms of tradeoffs between income and leisure. The theory predicts that primary civilian wage and hours worked and secondary wage and hours offered would affect the moonlighting decision. The higher the primary wage and the greater the number of hours worked, the lower would be the probability of moonlighting; while higher secondary wages and hours offered would tend to work in the opposite direction. In addition, our theory and empirical analysis included variables describing demographics, military experience, and regional variations.

We present below the empirical results of our analysis. These results span several different aspects of the Reserve reenlistment decision model. The first three analyses focus on evaluating the effects of the bonus (i) on the *reenlistment decision* using the full experimental sample, (ii) on the *term of commitment* among reenlisters, and (iii) the *long-term effects* of the bonus in terms of continued participation over time. The fourth analysis, based on survey responses, allows us to test the similarity between the Reserve participation decision and the civilian moonlighting decision by incorporating data on the primary jobs.

B. The 1978 Selected Reserve Reenlistment Bonus Test
B.1. Estimating the Effect of the Bonus on the Reenlistment Decision

The model was estimated at the individual level using variables from the personnel file to control for possible compositional differences among test and control regions. The dependent variable is dichotomous, equal to 0 if the individual chose to separate, and 1 if he chose to extend or reenlist for one to six years. The maximum likelihood technique was used to estimate the model. Table 1 presents the estimation results.

Table 1

REGRESSION RESULTS OF THE REENLISTMENT
DECISION MODEL: FULL SAMPLE

Independent Variable	Dependent Variable: Decision to Reenlist
	Coefficient
Constant	9.45
Availability of Bonus	.11*
Demographic Characteristics	
Year of birth	-.04*
Black	.39*
Some college	-.21*
Number of dependents	.09*
Married	.12*
Female	.05
Military Experience	
Pay grade (E1 - E7)	.47*
Motivation	-.72*
Combat MOS	-.19*
First-term males	-.45*
Length of first term (6 years)	-.33*
Component: Army Reserve	.12*
First term	-.13*
Regional Charactristics	
1978 unemployment rate	.08*
Log of 1978 per capita income	-1.06*
Number	14,221
Log Likelihood Ratio	1,184

NOTE: * Significant at 5 percent.

Most of the variables are self-explanatory. With the exception of year of birth, number of dependents, pay grade, and the regional variables, the independent variables are dichotomous, equal to 1 if the individual had the indicated characteristic.

The offer of a bonus has a highly significant effect on retention rates: Other things equal, those in the bonus group extended or reenlisted more frequently than those in the control group. The fairly small size of the coefficient, however, suggests that separation decisions may be only weakly sensitive to pay increases. The results show a roughly 5 percent increase in reenlistment for a secondary wage increase of 25-40 percent.

Older reservists have a lower separation rate than younger reservists. Age may be acting as a proxy for the value of Reserve retirement benefits. Since Reserve retirement benefits begin at the age of 60, older reservists are likely to have retirement benefits with a higher net present value and perceive this value more accurately than younger reservists. Greater job and family stability may also contribute to the lower separation rate among older reservists, who are less likely to encounter service-disrupting changes in jobs and family circumstances since the last enlistment or retention decision.

Other things equal, reenlistment rates increase with age and number of dependents, but decrease with marriage only. These results suggest that single reservists have higher retention rates than married, but that married reservists with dependents have higher retention rates than either single or married but childless reservists.

This pattern of participation resembles both civilian moonlighting behavior and participation in voluntary organizations. Moonlighting incidence rises with age from 16 to 44 and then falls off for older age groups (U.S. Department of Labor, 1978). Moreover, Shishko and Rostker (1976) show civilian moonlighting behavior increases with family size while Knoke and Thomson (1977) find voluntary association also depends strongly on age and the life-cycle stage.

Other things equal, higher retention rates are found among blacks and those with less education. These results probably reflect either taste for Reserve service or the more circumscribed and more uncertain

civilian economic prospects for blacks and the less educated. The sex variable was not significant, perhaps because of its collinearity with other variables in the analysis.

Reserve retention rates also show strong statistical dependence on variables describing previous military experience. The higher retention rates for higher pay grades may reflect the effects of status within the unit, higher present Reserve pay, and increased future promotion potential, which convert to higher future pay and retirement benefits. This effect may also reflect self-selection--those who decide not to reenlist would probably not seek or be given promotions.

Draft-motivated youth--that is, those with low lottery numbers-- had significantly lower retention rates than reservists who were not seeking to avoid the draft at the time of the original enlistment. Estimates from the regression results show that the retention rate for draft-motivated individuals (low lottery numbers) was 21 percent while volunteers (high lottery numbers) reenlisted at a rate of 49 percent. Thus, a major rise in retention rates would be predicted for the Reserve between FY78 and FY80 when the cohorts approaching first-term retention change from draft-motivated to volunteer. This effect illustrates the key trade-off between manning a Reserve force of a given size under a draft or volunteer system. A draft can more easily man a first-term force with higher-quality personnel, but it does so at the cost of having fewer personnel to select for career manning.

Several factors may contribute to the higher retention in the Army Reserve than in the National Guard. First, Army Reserve jobs tend to be in support areas (medical, transportation, maintenance, or electronics) for which there may be a high degree of civilian transferability. Second, promotion opportunities tend to be greater in the Army Reserve, since the grade structure calls for higher pay grades. Finally, National Guard call-ups in civilian emergencies may deter continuing participation because of conflicts with job or family commitments.

Other things equal, reservists in noncombat jobs reenlist at higher rates than those in combat jobs. Apart from the risk factor, the skills acquired in combat jobs cannot be easily translated into increased civilian job opportunities.

Males serving their first term had lower retention rates than others; also, shorter initial terms of service were associated with higher retention rates. These results must be viewed with caution as both variables are highly collinear with other variables.

The economic characteristics of the region in which a reservist resides are statistically significant in the model. Reservists who reside in areas with higher unemployment and lower per capita income have higher retention rates, implying that Reserve service may be at least partly economically motivated in terms of supplementing income and/or cushioning the risk of complete loss of income during unemployment. Perhaps a more important motivation for those presently unemployed may be the possibility of short-term full-time employment in the Reserve. Reservists can be sent for advanced full-time training lasting 1-6 months during spells of unemployment and full-time technical jobs often become available for which reservists may qualify.

B.2. Estimating the Effect of the Bonus on Extension/Reenlistment Decision Using the Experimental Sample

Another effect of the bonus is to extend the term of commitment. This effect is estimated by looking at the differences among *reenlisters,* between reservists choosing to extend (1- or 2-year commitment) or to reenlist (3- or 6-year commitment). The major reason for reservists choosing 3- or 6-year terms over the shorter time period was the bonus offer. The results are presented in Table 2.

The bonus had a significant effect on the length of term chosen, raising the percentage of those reenlisting for 3 or 6 years from 13 to 82 percent.

Although the variables measuring demographic composition, previous military experience, and regional economic characteristics are generally statistically weaker in explaining this reenlistment decision than the separation decision, the direction of the effects is, for the most part, the same for the two models.

With regard to demographic variables, reservists choosing 3- or 6-year terms tend to have less education and more dependents. Age, race, sex, and marital status are not statistically significant.

Table 8

REASONS FOR LEAVING GIVEN BY SEPARATING RESERVISTS
RETURNING 1978 BONUS TEST SURVEYS

Reason	Percentage
Conflict with family or leisure time	31.6
Conflict with civilian job	30.8
General dislike of military	11.4
Dislike of unit's training practice	7.1
Not eligible for 1978 reenlistment bonus	4.5
Moving to take a new job	2.9
Insufficient pay	2.0
Disagreement with personnel and pay policies	1.9
Job transfer	1.9
Distance to reserve unit	1.7
Conflict with education	1.7
Fear of call-up or mobilization	.8
Extra income not needed	.6
Health	.6
Not eligible to reenlist	.5

civilian moonlighting decisions. This is not too surprising. For the typical reservist in our sample, the net annual after-tax Reserve income represented only 7 percent of total annual after-tax income. Our analysis shows that a 25 percent increase in Reserve pay would raise total family income by only 2 percent. Nonmonetary considerations may dominate the reenlistment decision, such as conflicts with civilian job and/or family activities. For reservists with such conflicts, small increases in Reserve pay are unlikely to alter a decision not to reenlist. Indeed, such conflicts constitute the most frequently cited reasons for leaving the Reserves, as Table 8 makes clear.

As expected, both civilian hourly wage rates and civilian hours were highly significant and negatively related to the propensity to reenlist, lending credence to the belief that reservists behave like civilian moonlighters. However, the elasticities of -.21 and -.26 were much smaller than those measured for civilian moonlighting.

Characteristics of the Reserve job also affect reenlistment decisions. We found that a reservist's grade (after controlling for pay differences in position) significantly affected his reenlistment decision. Although part of this effect may be due to a reverse dependence (individuals not planning to reenlist may not work for promotion), it is consistent with the notion that status in a Reserve unit plays an important part in the decision to reenlist. We also found that reservists in noncombat jobs are more likely to reenlist than those in combat jobs.

Some aspects of the Reserve job strongly impact on the reservist's civilian job. For example, the Reserve job occasionally requires full-time participation (annual training), which may conflict with civilian work time. Reenlistment decisions depend importantly on employer attitudes and policies. This is borne out both by the model and the data previously displayed in Table 8.

Previous military experience and the circumstances of original enlistment were important determinants of reenlistment. Individuals who enlisted in the Reserve to avoid being drafted into the active force reenlisted at much lower rates than "volunteer" enlistees.

Table 7

REGRESSION RESULTS OF THE REENLISTMENT DECISION
MODEL: ARMY NATIONAL GUARD (Continued)

Independent Variable	Dependent Variable: Decision to Reenlist
	Coefficient
Regional Characteristics	
Middle-sized urban area	-0.708×10^{-1}
Small urban area	-0.109
Rural area	-0.851×10^{-1}
Suburban area	0.107
1978/1977 local inflation factor	0.125×10
Number of observations	2,876
Chi-squared	780.53

*Significant at 5 percent level.

**Significant at 10 percent level.

Table 7

REGRESSION RESULTS OF THE REENLISTMENT DECISION
MODEL: ARMY NATIONAL GUARD

Independent Variable	Dependent Variable: Decision to Reenlist
	Coefficient
Reserve Pay and Time	
Annual net drill and camp pay	0.230×10^{-3}**
Net reserve time	-0.470×10^{-3}
Reserve Experience	
Pay grade E3 or below	-0.561*
Pay grade E5	0.708*
Pay grade E6	0.113×10*
Pay grade E7 or above	0.293×10*
Combat job	-0.341*
Years of service	-0.955×10^{-1}*
Revealed Reserve Preference	
Draft motivation	-0.607*
Prior reenlistment	0.879*
Civilian Work Environment	
Free time	0.982×10^{-2}*
Civilian hourly wage	-0.753×10^{-1}*
Availability of paid overtime	-0.441×10^{-2}*
Must use vacation	-0.301
Employer's attitude	-0.249*
Federal government employment	-0.601×10^{-1}
State/local government employment	0.307
Middle-sized-firm employment	0.862×10^{-1}
Small-firm employment	0.204
Self-employed	-0.247
Spouse's annual earnings	-0.882×10^{-5}
Individual Characteristics	
Female	0.690*
Black	0.109×10*
Age	0.655×10^{-1}*
Married	-0.851×10^{-2}
Number in houehold	0.576×10^{-1}
Not high-school graduate	0.207
College graduate	-0.499*

Table 6

DEFINITIONS OF MODEL VARIABLES

Reserve Pay and Time	
Annual net drill and camp pay (ANDSCP)	Annual net reserve pay adjusted to cost of living
Net reserve time (NRT)	Net annual reserve time

Reserve Experience	
Pay grade E3 or below (PG3)	Indicator variable = 1 when pay grade is E1 to E3
Pay grade E5 (PG5)	= 1 when pay grade is E5
Pay grade E6 (PG6)	= 1 when pay grade is E6
Pay grade E7 or above (PG7)	= 1 when pay grade is E7 or above
Combat job (COMMOS)	= 1 for combat military occupational specialty (MOS)
Years of service (YOS)	Total years of service in Army Reserve or National Guard

Revealed Reserve Preferences	
Draft motivation (IEA)	= 1 if reservist enlisted to avoid draft
Prior reenlistment (PA)	= 1 if reservist had previously reenlisted at least once

Civilian Work Environment	
Free time (FT)	Reservist's leisure time
Civilian hourly wage (CAWR)	Civilian hourly wage rate adjusted to cost of living
Availability of paid overtime (WPOA)	Number of weeks per year reservist can earn overtime
Must use vacation (ESCP)	= 1 when employer does not allow military leave for annual training
Employer's attitude (EA)	Perceived employer attitude toward reserve job on scale of 1 (least negative) to 5 (most negative)
Federal government employment (FG)	= 1 when reservist is employed by U.S. government
State/local government employment (SLG)	= 1 when reservist is employed by state or local government
Middle-sized-firm employment (MSPR)	= 1 when reservist is employed by firm of 100 to 500 employees
Small-firm employment (SPR)	= 1 when reservist is employed by firm of less than 100 employees
Self-employed (SE)	= 1 when reservist is self-employed
Spouse's annual earnings (SAE)	Earnings of spouse in 1977

Individual Characteristics	
Sex (SEX)	= 1 if reservist is female
Race (BLACK)	= 1 if reservist is black
Age (AGE)	Age of reservist
Married (MS)	= 1 if reservist is married
Number in household (NIH)	Number of people in reservist's household
Not high-school graduate (NHSD)	= 1 if reservist did not graduate from high school
College graduate (CG)	= 1 if reservist graduated from college

Regional Characteristics	
Middle-sized urban area (MC)	= 1 when reservist lives in city of 50,000 to 250,000
Small urban area (SC)	= 1 when reservist lives in city of less than 50,000
Rural area (RU)	= 1 when reservist lives in rural area
Suburban area (SUB)	= 1 when reservist lives in suburb of large city
1978/1977 local inflation factor (RIF)	Ratio of 1978 to 1977 local inflation factor

The decision to reenlist in the Reserve is characterized as a dichotomous variable assuming the value of one for reenlistment and zero for separation. This model relates the reenlistment decision of the ith individual, Y, to a vector of characteristics for that individual, x_i. The assumed relationship is:

$$(1) \qquad Y_i = p(x_i) + \varepsilon_i \; ,$$

where

$$(2) \quad p(x_i) = P[Y_i = 1 | x_i] = \frac{1}{1 + e^{-(\beta_0 + \beta_1 x_{i1} + \beta_2 x_{i2} + \ldots + \beta_k x_{ik})}} \; ,$$

k denotes the number of characteristics measured for individual i, and β_0, β_1 . . ., β_k are the parameters of the model to be estimated.

We were able to estimate a reenlistment model which allowed for a much broader and richer set of regressors compared to the earlier analyses using data from 2,867 survey responses collected from National Guard personnel in the control areas of the 1978 Selected Reserve Reenlistment Bonus Test. Statistical comparisons of the populations returning and not returning surveys showed significant bias in the total sample but none in the Guard sample.[11] The reenlistment model[12] was estimated on the Guard sample only in order to mitigate problems often associated with estimates using survey data--namely, explicit bias due to survey nonresponse or an unknown bias due to lack of data for comparison between respondents and nonrespondents.

Table 6 shows the definition of variables and Table 7 presents the results of the estimation. The coefficients of the model were mostly consistent with the expectations of moonlighting labor market theory. In particular, other things equal, reenlistment rates tended to rise with net Reserve income and to fall slightly with net Reserve time, although the latter effect was not significant. The pay elasticity was only .2--much smaller than the moonlighting pay elasticity measured for

Table 5

MEMBERSHIP PERCENTAGES AND CONTINUATION RATES(a)

Time	Participation Percentages		Continuation Rates	
	Control	Bonus	Control	Bonus
During experiment	38.4	40.6	--	--
Second year	30.4	37.3	79.2	91.9
Third year	25.8	33.1	84.9	88.7
Fourth year(b)	25.7	32.0	95.2	92.0

(a) The participation percentage is the percentage of members of the _original_ bonus and control groups remaining in the service. The continuation rate is the percentage of the _previous year_'s group remaining in the service.

(b) The fourth-year percentages are based on the first-quarter sample.

their term. In that case, the bonus would have simply delayed their leaving, and the effect would be prevalent only for up to 6 years. However, another possibility is that the gap would remain until the participants retired, thus creating a manpower strength increase over a much longer period. In this case, the bonus would have served to delay separation decisions until the influence of the retirement system induced a career decision.

To assess whether initial longer reenlistment terms translate into higher reserve strength levels, test participants were followed through their second and third year after reenlistment, and into the first quarter of the fourth year (March 31, 1981). This last followup was particularly important as it provided a look at the reelistment decision of those who initially chose a 3-year term in the first quarter of 1978.

Table 5 summarizes the results of this follow-up: the percentages of the original groups remaining in the service and the continuation rates (the percentages of the previous year's groups remaining in the service). Although the bonus group is still larger during the fourth year, the continuation rate for the sample entering the fourth year is lower than for the control group as a result of 3-year reenlistees serving out their contract periods and then separating. However, as the table indicates, the gap between the test and control groups narrowed only slightly as a result of these decisions.

C. Estimating a Reenlistment Decision Model Using the Survey Sample of Army National Guardsmen

The simple model of the reservist's reenlistment decision based on moonlighting labor market theory had suggested four variables that could be expected to influence the reenlistment decision: net Reserve pay, net Reserve time, civilian wage rate, and number of hours worked on the civilian job. Previous empirical work has estimated the direction and magnitude of these variables with reference to choices for civilian moonlighting jobs. However, the qualitative aspects of the Reserve job and the characteristics that set it apart from other moonlighting or part-time jobs make it likely that these effects may change for the reserve job.
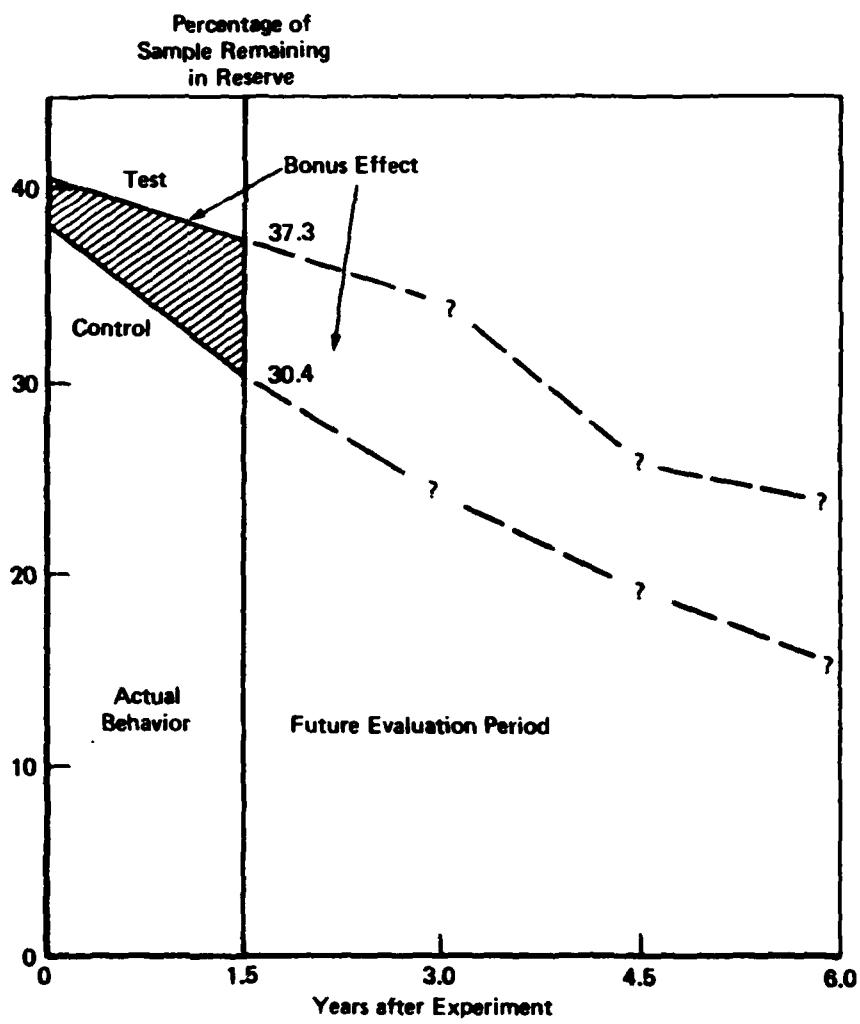
Fig. 1 -- Attrition of participants in the 1978 Bonus Test

Table 4

REENLISTMENT AND TERM-OF-COMMITMENT DECISIONS
FOR RESERVISTS IN THE 1978 BONUS TEST

Decision	Bonus Group(a)		Control Group(a)	
	Number	Percent	Number	Percent
Reenlistment				
Separated	3,496	59.4	5,134	61.6
Reenlisted or extended	2,390	40.6	3,201	38.4
Total	5,886	100.0	8,335	100.0
Term of Commitment				
1 year	436	18.2	2,801	87.5
3 years	571	23.9	333	10.4
6 years	1,383	57.9	67	2.1
Total	2,390	100.0	3,201	100.0

(a) The numbers and percentages are adjusted for small differences in the composition of the bonus and control groups.

stable difference through seven years, each additional man-year costs
$1,040. However, the projections indicated that the difference in
retention rates between the bonus and control groups was highly stable,
allowing one to assume a longer benefit period. For example, if one
assumes a 15-year flow of services (which would put many in the sample
close to or beyond the 20-year point), the cost per additional man-
year declines to $450. In the latter case, the total bonus cost of
10,000 additional man-years over the 15-year period would be $4.52
million.

B.4. Summary of the Effects of the Bonus on Reserve Reenlistment

The offer of a bonus may affect three possible decisions facing a
reservist: the decision to separate or reenlist, the choice of the
reenlistment term, and the actual length of service. Table 4 summarizes
the reenlistment and length-of-term effects of the bonus.[10] The bonus
boosted Reserve compensation for those accepting by 25 to 40 percent.
However, it increased reenlistment rates only marginally to 40.6 percent
in the bonus group as compared to 38.4 percent reenlistment in the
control group. On the other hand, the bonus definitely encouraged
longer terms of commitment. Among reservists who reenlisted, 82 percent
chose 3-year or 6-year terms, while only 12 percent of those in control
regions did so. The average term of commitment amounted to 4.4 years
for the test region and 1.3 years for the control region.

Analyses of actual participation as of December 3, 1979, one year
after the completion of the test indicated that the bonus group declined
from 40.6 to 37.3 percent of the original sample while the control group
dropped from 38.4 to 30.4 percent (Fig. 1). Of those who originally
chose to stay in the reserve, 91.9 percent of the bonus group and 79.2
percent of the control group remained until December 31, 1979. Thus, by
lengthening the term of commitment and postponing subsequent separation
decisions, the bonus tended to reduce overall separation from the bonus
group.

This gap in participation rates (37.3 percent versus 30.4 percent)
could easily disappear if those reservists who accepted bonus payments
for 3- and 6-year terms exhibit low reenlistment rates at the end of

Table 3

REGRESSION RESULTS OF THE SUBSEQUENT
PARTICIPATION MODEL: FULL SAMPLE

Independent Variable	Dependent Variable: Membership as of Specified Date	
	Third Year (Dec. 1980)	Fourth Year (Mar. 1981)
Constant	9.12	7.83
Availability of Bonus	.41*	.34*
Demographic Characteristics		
Year of birth	-.04*	-.03
Black	.38*	.41*
Some college	-.19*	-.14
Number of dependents	.09*	.04
Married	-.09	-.24*
Female	-.01	-.19
Military Experience		
Pay grade (E1 - E7)	.42*	.51*
Draft motivated	-.84*	-.55*
Combat MOS	-.18*	-.09
First-term male	-.35*	-.24
Length of first term (6 years)	-.41*	-.75*
Components: Army Reserve	.07	.22*
First term	-.12	-.45
Regional Characteristics		
1978 unemployment rate	.09*	.04
Log of 1978 per capita income	-1.07*	-1.01
Number	14,221	3,013
Log Likelihood Ratio	1,017	185

NOTE: * Significant at 5 percent.

B.3. Estimating the Effect of the Bonus on Subsequent Participation

The design of the bonus progrʌm implied that the bonus could have both short-term and long-term effects on reserve manning. The short-term measures include the reenlistment rates and length of initial commitment. However, the latter may not be a good long-term evaluation measure since shorter commitments could later be extended while longer commitments could be broken. If so, a possible decline in the participation rate may occur as those who signed up for 3 years (in order to receive the bonus) have the opportunity to leave without breaking their commitments. Thus, to evaluate the long-term effects on reserve strength, we need to analyze longitudinal data on actual participation.[9]

The model presented in Table 3 estimates the bonus effects and analyzes reserve participation in terms of individual and regional characteristics as of December 31, 1980, and March 31, 1981. The dependent variable in each model is dichotomous, indicating whether an individual was still participating or not as of a specified date. Participation rates as of March 31, 1981, are analyzed only for reservists whose original decisions were made in the first quarter of the test year (1978). Because they had served 36 to 38 months since their original decisions, we were able to assess the reenlistment behavior of those who had originally chosen 3-year terms, and had come up for another reenlistment decision at the end of that period.

The most important finding of the models is that individuals in the bonus grouʳ have a significantly greater probability of remaining in the service through the fourth year even accounting for the effects of other variables.

Once we discovered how the continuation rates would change over time, we could estimate how many additional man-years were added as a result of the bonuses. Also, knowing how many reservists accepted the $900 and the $1,800 bonuses, we could calculate the total bonus cost. Thus, we could estimate the cost per (additional) man-year.

Of course, the total benefits depend upon how long the retention-rate difference between bonus and nonbonus groups remains. For example, if one assumed the actual rate through three and one-fourth years and a

Table 2

REGRESSION RESULTS OF THE EXTENSION/REENLISTMENT
DECISION MODEL: REENLISTERS ONLY

Independent Variable	Dependent Variable: Decision Reenlist for 3- or 6-year term Coefficient
Constant	13.20
Availability of Bonus	3.82*
Demographic Characteristics	
Year of birth	.01
Black	.04
Some college	-.21*
Number of dependents	.11*
Married	-.17
Female	.33
Military Experience	
Pay grade (E1 - E7)	.12*
Motivation	-.47*
Combat MOS	-.24*
First-term males	.51*
Length of first term (6 years)	-.27
Component* Army Reserve	1.15*
First term	-.05
Regional Characteristics	
1978 unemployment rate	-.05
Log of 1978 per capita income	-1.80*
Number	5,586
Log Likelihood Ratio	1,631

NOTE: * Significant at 5 percent.

Finally, the demographic composition and education of the reenlisting cohort significantly affected reenlistment. Females, blacks, and those with less education reenlisted at higher rates. This finding is consistent with the notion that Reserve participation may serve as a hedge against potential unemployment. Also, older reservists reenlisted at higher rates than younger reservists, either due to the increased value of retirement income or to a more stable civilian and family life.

The analysis of Reserve retention has pointed to a dramatic increase in retention rates due to the shift to a volunteer force. The retention problems of the Reserve in an AVF look manageable under current force size. However, the increase in retention rates may not be sufficient to fully man certain units because of local labor market conditions or demand for unpopular skills. In these cases the bonus would seem to be an effective tool for boosting long-term career supply.

To take advantage of these high retention rates, however, individuals must survive their first term in service. Analysis of Reserve attrition rates during the first term has shown high levels of Reserve attrition. Thus, a major manning problem for the Reserve may be attrition during the first term--the subject of the next section.

II. THE RESERVE ATTRITION DECISION

Attrition in the Reserves can be categorized as being either programmed or unprogrammed. Programmed losses occur at the end of the enlistment term whereas unprogrammed losses--the focus of this section-- occur before completion of the committed term.

A. Theoretical Framework for Analyzing Attrition

At the time of enlistment, the reservist and the Reserve component enter into a contract. Presumably, the enlistment decision is deemed in the best interests of both parties, based on a calculus of perceived costs and benefits relevant to each. At the time of attrition, this calculus clearly has changed for at least one of the involved parties, and separation is regarded as the best course of action.

The first step in explaining Reserve attrition decisions requires identifying the changes that can occur to tip the decision calculus for either the individual or the Reserve component from an original enlistment decision to a separation decision. There are two major types of changes that might occur during the enlistment term.

(a) Accumulation and Reevaluation of Information After Enlistment

The recent literature in labor market theory attempts to include and explain quitting behavior, in terms of individual and firm uncertainty and imperfect information. One such approach assumes that there are unobservable characteristics of the job that can be learned only through experience on the job. Pencavel (1972) has stated that "the taking on of a job for a trial period may be the optimum method for an individual to discover whether that employment suits him." In these experience models, jobs then are possessed of two classes of attributes: general characteristics (also called "search" characteristics) which can be observed directly or without actually consuming the "good," and specific characteristics ("experience" characteristics) which become evident only through actual experience. The acceptance of any job is conditional; if the jobholder finds the value c^f the experience attribute (about which he was imperfectly informed) below some critical level, he will quit.

This model can be easily extended to include job separations initiated by the employer (fires), by positing two types of employee attributes--screening attributes, which can be observed by the employer prior to employment, and performance attributes, observed by the employer only after the individual works on the job. The attrition process can then be viewed as the consequence of rational decisionmaking in which belated information regarding the various experience attributes of the moonlighting job and the performance attributes of the employee is received and reevaluated by both the worker and employer. Critical levels exist for both the employee and the employer. Separation will occur if either employee performance on the moonlighting job does not exceed the critical performance level for the employer, or "moonlighting

job experience attributes" do not exceed some threshold set by the employee.

Several aspects of holding a reserve job may be classified as experience attributes for a typical enlistee. These would include the regimentation and competition inherent in military training, and the large difference between Reserve gross and net pay.[13]

For the Army, several performance attributes cannot be observed or predicted accurately from pre-enlistment observation or testing. The Armed Services Vocational Aptitude Battery (ASVAB) is partly designed to predict cognitive trainability, and physical examinations are used to screen for physical trainability. However, both of these entrance tests are imperfect and do not screen for the important dimension of psychological adjustment to the military environment.

To this point, we have used the simple model developed for separations from full-time jobs and applied it in a straightforward way to moonlighting jobs. However, the model requires two extensions to make it applicable to separation from the Reserves. First, separations may occur not only because of the experience attributes of the moonlighting job, but because such attributes may in turn interact with the experience attributes of the primary job such as conflicts with the employer or with scheduling. Second, separations may occur if the experience attributes *reinforce* a taste for military service instead of vice versa; the reservists may then choose to join the Active Force. Thus, Reserve enlistment may be essentially a stepping stone to active force enlistment. Our survey data on reservists show that a strong motivation for joining the Reserve rather than the active force is to "try out" military service. Indeed, our attrition data show that over the first two years of reserve enlistment, 4-8 percent of a Reserve cohort joins the Active Force.

(b) Change in Marital Status, Employment Status, or Residence During Enlistment

The commitment to the Reserve job and term of service is played out during a stage of the life cycle when more important commitments are being made and changed. Initial labor market entry and attachment and early career development often mean trying different full-time jobs.

During this life cycle stage marriage and family formation often necessitate moves to larger housing or moves based on improving economic well-being.

During the six-year period of enlistment, a change[14] is likely to occur in the enlistee's marital status, employer, or geographical location of home; any one of these changes means the individual will have to reevaluate his commitment to the reserve job in light of new circumstances. The likelihood of separation will depend on (1) the probability of these changes occurring and (2) the probability that a given change will actually lead to separation.

Survey data collected at the first term retention point show that the two main reasons cited for not reenlisting are employer and family conflicts. These conflicts are operative during the first term as well and contribute to early attrition. Changes in marital status or employment carry with them the potential for conflict. Geographical moves create a different problem. While transfers to units at the new home is possible, excessive distance or skill mismatch may make this transfer difficult.

Hypotheses deriving from this framework regarding the effect of particular variables on the probability of early separation are frequently theoretically indeterminate. The traditional emphasis has been on recruiting individuals with high probabilities of completing training; our theory shows that characteristics contributing to stability of life situations may prove to be equally important. For example, other things being equal, older reservists would be more likely to stay having made presumably more mature decisions in the first place, based on an informed job-search process and a thorough evaluation of job and family demands. However, particularly during the training period, the physical rigors of training may well favor younger reservists. Thus, a priori, we cannot predict the effect of age on attrition. Careful analysis of attrition data can help determine the relative importance of trainability and stability of life situations.

Blacks should have lower attrition rates. They seem to exhibit a lower likelihood of geographical moves or job changes and less chance of early marriage. Women should have higher attrition rates than men. The likelihood of meeting physical training standards is somewhat lower for

women. Also they are more likely to marry during the prime enlistment years and/or move. In addition, women are more likely to face spouse conflict due to their traditional role in the family. Pregnancy and childrearing may also increase separation rates for women.

Higher educational attainment and AFQT scores should be associated with lower attrition. More educated individuals and those with higher AFQT scores would be more likely to make sound enlistment decisions and meet training standards--especially AIT training. Little data is readily available to determine the differences in marriage rates or job separation rates by education for those not attending college.

The primary data source for Reserve personnel information is the Reserve Components Common Personnel Data System (RCCPDS) maintained by the Defense Manpower Data Center (DMDC). The cohort files for each fiscal year contains the enlistment records, subsequent master file records, and any loss records for all individuals identified as gains during that fiscal year.

The FY80 Army Reserve and Army National Guard cohort was chosen for this analysis because the quality of data on individuals was markedly improved from earlier cohorts and it could provide at least two years of *recent* attrition history. In particular, earlier cohort data could not distinguish between high school dropouts and seniors who had not yet graduated from high school. Many youths join the Reserves during their senior year and enter training after completion of high school. In earlier cohorts, these individuals were classified along with high school dropouts.

B. Attrition From the Army Reserve and Army National Guard

There are many reasons for leaving the Reserve component. Our computerized records can identify losses who later appear on active duty or return to a selected Reserve component or the Individual Ready Reserve (IRR), Standby Reserve, or Retired Reserve and to civilian life. In this section we combine the latter two categories into a single category of loss to civilian life.

It is important to distinguish between those who return to Selected Reserve components or to the active force and those who simply return to civilian life. A loss to the active force may, in fact, bring more

return on training investment than Reserve service, and be considered an
asset to the total force by planners. A loss to another Selected
Reserve component brings more return on training investment than a loss
to civilian life, but less than retention by the original component
since retraining would ordinarily be required in a new unit.

The Army National Guard lost 30.5 percent of the 1980 cohort to all
loss categories during the first two years after enlistment, while the
Army Reserve lost 39.6 percent during the same period (Table 9). The
timing of the losses is strikingly dissimilar across the two services.
The Army National Guard has higher training attrition and lower
posttraining attrition than the Reserve. This suggests that different
attrition and training policies may be operative in the two components.
If the Guard has more stringent training standards or is more successful
at detecting and dismissing potentially unproductive recruits, then
posttraining attrition would be lower, as the data suggest. The
different pattern may also reflect the different training and screening
procedures used in combat versus noncombat skills, or simply reflect
different timing of reporting attrition in the two components.

Overall attrition to civilian life (Table 10) is somewhat higher
for the Army Reserve: 25.4 percent for the Army National Guard and 28.3
percent for the Army Reserve. The major difference in attrition pattern
is that a significantly large portion of posttraining losses for the
Army Reserve return to Reserve components or the Active Force (11.2
percent) as compared to the Army National Guard (5.6 percent). Army
reservists may enter the active force at higher rates since they are
originally recruited by recruiters who enlist both Active and Reserve
personnel. These recruiters may simply continue to recruit these
reservists for the active force after Reserve enlistment. Transfer may
be relatively easy since the processing for the Reserve and Active
components is similar. In contrast, Guardsmen may have more barriers to
active enlistment. Individuals would have to take initiative themselves
to contact Active Force recruiters to enlist in the Active Force and
partial reprocessing would be necessary since the Guard enlistment
processing system differs somewhat from the Active system. ASVAB tests,
for example, would have to be retaken.

Table 9

ATTRITION RATES BY TIMING OF LOSS,
ARMY NATIONAL GUARD AND ARMY RESERVE, FY80 COHORTS

Timing of Loss	Army National Guard	Army Reserve
Percent of total cohort lost		
During pretraining and training	18.8	8.9
During posttraining first year	1.9	10.8
During posttraining second year	9.9	19.8
Percent of total cohort remaining after two years	69.4	60.5

Table 10

ATTRITION DURING THE FIRST TWO YEARS BY TIMING AND DESTINATION
OF LOSSES, ARMY NATIONAL GUARD AND ARMY RESERVE, FY80 COHORT

| | Percent of cohort lost: | | |
| | During Pretraining and Training | During Posttraining | Total |
Destination of Loss			
	Army National Guard		
Percent of total cohort lost:			
To civilian life	17.8	7.6	25.4
To other selected reserves	0.3	0.8	1.1
To active force	0.7	3.4	4.1
Total percent lost	18.8	11.8	30.6
	Army Reserve		
Percent of total cohort lost:			
To civilian life	7.4	20.9	28.3
To other selected reserves	0.7	2.9	3.6
To active force	0.8	6.8	7.6
Total percent lost	8.9	30.6	39.5

Two year attrition rates are strikingly different between males and females (Table 11). For both the Army National Guard and Army Reserve, approximately 46 percent of women leave prior to the completion of two years of service as compared to approximately 29 percent of men in the Army National Guard and 37 percent in the Army Reserve. The different pattern between the two components in the timing of attrition holds for both men and women. For females in the Guard, training attrition is 32.1 percent compared to only 10.9 for the Reserves. However, during posttraining, the Guard attrition rate for women is 13.5 versus 34.2 for the Reserves.

C. Estimating the Attrition Decision Model

Empirically, the attrition process is summarized by a dichotomous dependent variable that categorizes individuals as stayers or leavers. The outcome variable is defined as:

(3) Y_{it} = 0, if individual i stayed through time period t; and
        1, if individual i separated during time period t.

Models were estimated for three time periods: (1) t = 1: pretraining and training period, (2) t = 2: posttraining period extending from the end of training to two years from date of enlistment, and (3) t = 3: first two years from date of enlistment. Thus, for the ith individual, three separate outcome variables were defined, as being 0 or 1 depending on whether the reservist stayed or left during the given period. Of course, any individual who separated during the pretraining and training period was clearly not faced with the choice of staying or leaving during the posttraining period. Such individuals were automatically excluded from the posttraining attrition model.

Before discussing the empirical results obtained by fitting this model to data from the FY80 cohort, we must mention two caveats. It is clear that the nature of the primary job and employer attitudes may be important in affecting a recruit's decision to stay or separate.

Table 11

ATTRITION DURING THE FIRST TWO YEARS BY
TIMING OF LOSS FOR MALES AND FEMALES,
ARMY NATIONAL GUARD AND ARMY RESERVE, FY80 COHORT

| | Percent of cohort lost: | | |
	During Pretraining and Training	During Posttraining	Total
	Army National Guard		
Male	17.3	11.6	28.9
Female	33.1	13.5	46.6
	Army Reserve		
Male	7.8	28.9	36.7
Female	10.9	34.2	45.1

Unfortunately, neither of these variables was available. Second, little data are available describing service-related experiences which also may affect early attrition.

As mentioned earlier, not all losses are losses to the total force. The models, therefore, have been estimated using two definitions of attrition: (i) loss to civilian life only and (ii) all losses.

We first present two-year attrition models, followed by separate models for training attrition and posttraining attrition. Each of the independent variables is dichotomous, equal to one if the individual has the defined characteristic, zero otherwise. Rather than the regression coefficients, the tables report attrition probabilities. These probabilities are calculated as:

$$(4) \quad P(x_i) = \frac{1}{1 + e^{-(\alpha + \sum_j b_j X_{ij})}}$$

where $P(x_i)$ = probability of attrition of a specific reservist i,

x_{ij} = values of the explanatory variable j for reservist i, and

b_j = estimated coefficients for the x_j.

Table 12 reports the probability of attrition within two years of enlistment separately for males and females with differing characteristics. As shown earlier, preliminary analysis revealed that attrition patterns are markedly different for males and females in these two reserve components.

The numbers reported are estimated attrition probabilities for an individual with the designated characteristics. For each column, a reference individual is defined and the attrition probability given for that individual. Attrition probabilities are then given for an individual who differs from that reference individual by changing one characteristic at a time. In Table 12, the first column gives the attrition probabilities for male Guardsmen. The attrition probability is .18 (18 percent) for the reference individual who is a single, nonblack, high school graduate, 18-20 years old and mental category 3.

Table 12

TWO-YEAR ATTRITION PROBABILITIES FOR MALE AND FEMALE
RESERVISTS WITH DIFFERENT CHARACTERISTICS:
LOSSES TO CIVILIAN LIFE/INDIVIDUAL READY RESERVE ONLY

	Army National Guard		Army Reserve	
	Male	Female	Male	Female
Attrition probability for				
reference individual(1)	.18	.44	.19	.35
Race				
Nonblack(2)	.18	.44	.19	.35
Black	.23*	.36*	.22*	.27*
Education				
High school graduate(2)	.18	.44	.19	.35
Nonhigh school graduate	.31*	.62*	.31*	.48*
Age				
Less than 18 years	.15*	.34*	.16*	.36
18-20 years(2)	.18	.44	.19	.35
21 years or older	.25*	.41	.21*	.33
Family Status				
Single, no depenents (2)	.18	.44	.19	.35
Single, with dependents	.18	.47	.18	.36
Married, no dependents	.21*	.51*	.19	.38
Married, with dependents	.19	.51*	.18	.35
AFQT				
Category I	.12*	.27*	.13*	.25*
Category II	.14*	.38*	.16*	.31*
Category III (2)	.18	.44	.19	.35
Category IV	.25*	.51	.22*	.36
Interactions				
Black, nonhigh school graduate	.35*	.52	.33	.41
Black, age <18	.18	.33	.19	.26
Black, age >20	.28	.31	.22*	.22

(1) For individual with reference characteristics (nonblack, high
school graduate, 18-20 years, single, MCAT3).
(2) Reference characteristic.
(*) Regression coefficient significant at .05 level.

If that individual were black instead of nonblack, but had all the other characteristics, the attrition probability would be .23 (23 percent). Starred entries indicate that the characteristic is statistically significant at the .05 level.

The results for the Army Reserve males are remarkably similar to the National Guard males. The attrition probability for the reference individuals is 18 percent in the Guard and 19 percent in the Reserve. The education and mental category variables show strong and similar effects for the Reserve and Guard. Higher levels of education and higher aptitude category reduces attrition markedly. Attrition also increases with age for both components, but marital status and number of dependents has only small effects.

Comparing female results between the Guard and Reserve shows a much lower attrition rate for women with the same reference characteristics in the Reserve (35 percent) than the Guard (44 percent). Otherwise, the effects of education and mental category are also strong for both components, though less pronounced for the Reserve.

To summarize, other things equal, women have markedly higher attrition rates in both the Guard and Reserve than do men, and the pattern of attrition between women and men shows both similarity and major differences. Education and mental category for both sexes are important determinants of attrition behavior, although stronger determinants in the Guard than the Reserve. The major difference between male and female attrition patterns is the effect of race. Other things equal, black women have lower attrition than nonblack women, while black men have higher attrition rates than nonblack men. This pattern is present in both components. Another somewhat less significant difference is that, other things equal, women over 20 have lower attrition than 18-20 year olds, while men over 20 have higher attrition than 18-20 year olds. The effects of marital status and dependents shows somewhat inconsistent effects. For the Reserve, the effects are never significant. For the Guard, married women with and without dependents have higher attrition. For males, only those without dependents have higher attrition.

When the analysis includes losses to the active force and other
reserve components in addition to losses to civilian life, slightly
different patterns emerge (Table 13). The results show that the Guard
attrition patterns change little by including these additional losses.
The major change is to increase the loss rate for our reference male
from 18 to 23 percent, and for our reference female from 44 to 50
percent. Approximately 17 percent of male and female losses from the
Guard is to the Active Force or other Reserve components.

For the Army Reserve the loss rate for the male reference group
increases from 19 percent for civilian losses to 29 percent for all
losses. For the female reference group, the attrition rate increases
from 35 to 48 percent. The Army Reserve loses more individuals to the
active and other components than does the Guard. Twenty-eight percent
of Reserve separations are to the Active or Reserve Forces. The
inclusion of these additional losses does not significantly change the
pattern of significance of the variables.

D. Estimating the 'Timing of Attrition' Model

We have thus far examined overall attrition, i.e., losses during
the first two years of service regardless of the timing of attrition.
Here we present separate attrition models for two periods: from
enlistment to the completion of training, and from the completion of
training to the end of the second year (the posttraining period). The
models allow us to test the extent to which different influences seem to
be operating during these periods. Our theory had suggested that there
might be plausible reasons to believe that factors influencing early
attrition decisions (defined here as attrition prior to or during
training) are likely to be different from those leading to posttraining
attrition, albeit with a good deal of overlap across the two sets. We
had hypothesized that performance and experience attributes would
dominate early attrition while mobility attributes would dominate later
attrition. It is important to distinguish between these influences
since different policies are required to address each problem.

Table 13

TWO-YEAR ATTRITION PROBABILITIES FOR MALE AND FEMALE
RESERVISTS WITH DIFFERENT CHARACTERISTICS: ALL LOSSES

	Army National Guard		Army Reserve	
	Male	Female	Male	Female
Attrition probability for reference individual(1)	.23	.50	.29	.48
Race				
Nonblack(2)	.23	.50	.29	.48
Black	.29*	.44*	.37*	.40*
Education				
High school graduate(2)	.23	.50	.29	.48
Nonhigh school graduate	.35*	.64*	.42*	.60*
Age				
Less than 18 years	.21*	.42*	.28	.47
18-20 years(2)	.23	.50	.29	.48
21 years or older	.29*	.47	.30	.42*
Family Status				
Single(2)	.23	.50	.29	.48
Single, with dependents	.23	.53	.28	.49
Married	.25*	.56	.32	.54*
Married, with dependents	.24	.55	.29	.48
AFQT				
Mental category 1	.18*	.35*	.24*	.34*
Mental category 2	.21*	.46*	.27*	.44*
Mental category 3(2)	.23	.50	.29	.48
Mental category 4	.29*	.56	.31	.48
Interactions				
Black, nonhigh school graduate	.38*	.58	.43*	.51
Black, age <18	.27	.40	.35	.36
Black, age >20	.34	.37	.33*	.31

(1) For individual with reference characteristics (nonblack, high
school graduate, 18-20 years, single, MCAT3).

(2) Reference characteristic.

(*) Regression coefficient significant at .05 level.

The results of the training and posttraining attrition models for males only are presented in Table 14. The dependent variable includes losses to either civilian life, other components, or the active force. The results show that the probability of attrition during training for our reference individual is much higher in the Guard than the Reserve. An individual male with reference characteristics has a 13 percent training attrition probability in the Guard and a 7 percent probability in the Reserve.

Four hypotheses may be put forward to explain the markedly different training attrition probabilities for similar individuals in the two components. The first is simply the presence of differing training methods and/or standards by component: either because of the different skill mix required in each component or the different qualitative and performance standards for the two components.

The second hypothesis focuses on the basic accuracy of the data recorded at enlistment for the Guard and Reserve. In 1980,[15] Guard enlistees were given aptitude tests by Guard recruiters, whereas Reserve personnel were cycled through the Armed Forces Entrance and Examining stations(AFEES). Test conditions are probably more uniform and compromise is less likely in the latter case. If Guard test scores are inflated, it would result in higher training attrition for individuals who appear to have similar characteristics.

A third explanation is that different preenlistment screening occurs in the Guard and Reserve. Individuals from each component can attend a weekend drill prior to enlistment. If this attendance is not uniform by component and significant experience or performance attributes are gathered by the individual or component, it could result in self selection and differing training attrition results.

A fourth hypothesis posits that the timing of losses are reported differently in the Guard and Reserve, and some of the Reserve posttraining losses may actually be during the training period.

Some evidence about which of these hypotheses might be accurate can be garnered from the posttraining attrition results. Here, the opposite pattern emerges. For reference males the probability of attrition during posttraining is markedly higher in the Reserve than in the Guard.

Table 14

TRAINING AND POST TRAINING ATTRITION FOR
MALES: ALL LOSSES

	Army National Guard		Army Reserve	
	Training	Post-training	Training	Post-training
Average Attrition Probability(1)	.13	.12	.07	.24
Race				
Nonblack(2)	.13	.12	.07	.24
Black	.14*	.17*	.07	.32*
Education				
High school graduate(2)	.13	.12	.07	.24
Nonhigh school graduate	.22*	.17*	.07	.38*
Age				
Less than 18 years	.12	.11	.12*	.21*
18-20 years(2)	.13	.12	.07	.24
21 years or older	.19*	.12	.06	.24
Family Status				
Single(2)	.13	.12	.07	.24
Single, with dependents	.13	.10	.07	.22
Married	.16*	.11	.07	.26
Married, with dependents	.15*	.11	.07	.23
AFQT				
Mental Category 1	.09*	.11	.07	.18*
Mental Category 2	.10*	.12	.07	.21*
Mental Category 3(2)	.13	.12	.07	.24
Mental Category 4	.19*	.12	.07	.25
Interactions				
Black, nonhigh school graduate	.22*	.22	.05*	.41*
Black, age <18	.15	.15	.20*	.25
Black, age >20	.20	.18	.05	.29
Black, married with dependents	.11*		.06	
Nonhigh school graduate, age <18	.18*		.09*	
Nonhigh school graduate, age >20	.31		.09	

(1) For an individual with the reference charɑᵉristic (nonblack, high school graduate, 18-20 years old, single, MCAT3).
 (2) Reference characteristics.
 (3) Regression coefficient significant at .05 level.

For males, the posttraining attrition probability for the reference individual is 12 percent for the Guard and 24 percent for the Reserve. The pattern of lower posttraining attrition rates combined with higher training attrition rates is consistent with the hypothesis that training methods or standards differ between the two components. If less screening is done during training, then one would expect higher posttraining attrition rates. If, on the other hand, training standards were similar for the components, but either self selection or data discrepancies were present, one would expect higher training attrition, but not necessarily lower posttraining attrition.

The differing effects of the demographic and aptitude variables on training and posttraining attrition provide some supporting evidence for the hypothesis that different methods or standards are present. The training attrition model for Guard males showed that education, age, marital status, and aptitude score are statistically significant in affecting attrition. For the Reserve, none of these variables was important in the training model, and only a single variable--less than 18 years of age--shows a statistically significant effect. These Reserve results show almost a random training attrition pattern--at least with respect to the variables available for this analysis--and are consistent with a fairly minimal level of screening for the Reserves. The posttraining results show the opposite pattern of variable discrimination. For the Reserve posttraining model, education, age, and mental category were statistically significant with the expected signs. On the other hand, the Guard showed more of a random pattern in the posttraining period.

This suggests that the different methods or training attrition policies may not affect the long-term level of attrition losses, but simply the timing of those losses. It may be that for the combat support skills present in the Reserve, it is better to allow on the job experience during the training period to weigh more heavily in the attrition decision. It may also be the case that proper screening is not done during training, and units inherit the burden of separating unproductive individuals during the posttraining period.

III. CONCLUSIONS

The theory of moonlighting labor market participation has successfully predicted the signs of critical variables in the Reserve reenlistment decision. These variables include the reserve or secondary wage, the primary or civilian job wage, and hours worked on the primary and secondary job. However, the elasticities for the Reserve job have tended to be much smaller than those measured for the civilian moonlighting market. Whereas the elasticities for civilian job moonlighting had elasticities at about one for primary wage, secondary wage, and primary hours worked, the equivalent reserve decision variables show elasticities of around .2-.3. One possible explanation for the difference is that Reserve benefits are not included in the analysis. The Reserve job carries retirement, educational, and some other benefits not likely to be duplicated by civilian moonlighting jobs. Another explanation is that tastes and/or nonpecuniary rewards play a more important role in the Reserve decision. This explanation is strongly supported by both anecdotal evidence and interviews with reservists. It is also evidenced by the significance of certain demographic and military rank variables when compared to empirical work on participation in voluntary associations.

Both the results of the experiment and the estimates of the Reserve reenlistment model using the survey data are consistent with a small secondary wage elasticity for Reserve reenlistment. The major effect of the bonus was not to raise reenlistment rates markedly, but to lengthen the actual participation of those already reenlisting through longer terms of commitment. At the end of 3 1/4 years after the original reenlistment decision, the test group had 32.0 percent of the original group left compared to 25.7 percent for the control group. The marginal cost of an additional manyear is between $500 and $1,000.

Reserve first-term retention rates have risen dramatically between 1977 and 1980 as volunteer cohorts have replaced draft-motivated ones. These increased retention rates should be sufficient to satisfy overall career force manning requirements, but will probably still leave skill or location-specific shortages. The reenlistment bonus could be used to alleviate such shortages.

Although first-term retention rates are high, we need to ensure that sufficient numbers survive till that decision point. The Reserves have unusually high levels of first-term attrition for nonprior service enlistees. An estimated 3 in 4 Army Reservists and 6 in 10 National Guardsmen from the 1980 cohort who enlist for six years will separate before reaching a first-term decision. These high levels of attrition are partially explained by intercomponent and active transfers, the quality of enlistees, and the turbulence of the civilian lives of individuals during the formative period of labor force entry and family formation. Other things equal, lower attrition rates are evident for males, those with higher educational attainment and aptitude scores. The difference between males and females is particularly large. The higher rates for women might be explained by the fact that females marry and start families at earlier ages, have higher rates of geographical mobility during their early twenties, and experience more spouse conflict than men due to traditional family roles. We have no evidence on the extent to which institutional factors or nontraditional jobs exacerbate these differences.

Institutional factors were shown to play an important role in accounting for differences in Reserve and Guard attrition. During training, the Guard has much higher levels of attrition, but lower levels of posttraining attrition. Reserve training attrition appears to be lenient, but at the price of high levels of posttraining attrition. Guard training attrition appears to discriminate successfully between stayers and leavers as evidenced by the random level of posttraining attrition. Institutional policy also probably plays an important role in governing transfers between Reserve components and Active Force/Reserve transfers. These transfers are an important component of attrition for the Army Reserve.

Besides better quality of reserve recruiting, Reserve attrition could be reduced by improved systems and procedures for tracking reservists who move and probably by more attention to family and employer support policies.

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ENDNOTES

[1] Ironically, the earliest research available was directed at the Air Force--the service that needed it the least. See Rostker (1973), Rostker and Shishko (1973), and Rostker (1974).

[2] See *Report of the President's Commission on an All Volunteer Armed Force*, 1970.

[3] The sample of eligible reservists contained 15 percent who had served a 3-year initial term.

[4] For a more detailed description of the experimental design and results of the test, see Grissmer, Doering, and Sachar (1982).

[5] A reservist must accumulate 50 points annually to achieve a year of satisfactory service. Reservists get one point for each day of annual training and each drill attended. In addition, 15 points are given annually for unit membership. Perfect attendance would merit 77 points. Pension payments are tied directly to total points accumulated.

[6] The 204 hours involve two quite different kinds of participation: Monthly drills require 16 hours of work, usually during a single weekend; annual training requires 14 days of full-time work, usually for two consecutive weeks during the summer.

[7] See U.S. Department of Labor (1978).

[8] See Shishko and Rostker (1976).

[9] For more detail, see Grissmer and Hiller (1982).

[10] These and subsequent estimates given in this section are based on the logit estimations given earlier in the chapter.

[11] These statistical comparisons were made possible by linking social security numbers given on survey forms with those on the enlisted personnel records of all reservists in the original experimental sample.

[12] For more detail, see Burright, Grissmer, and Doering (1982).

[13] The difference between gross and net pay is large for reservists for three reasons. First, approximately 30 percent of a reservist's annual pay is earned at annual training, during two full-time weeks in the summer. During this period, most reservists do not receive civilian income; thus, reserve pay simply substitutes for civilian income and may

not contribute to net annual income. Second, reserve pay will be taxed at a higher marginal tax rate than civilian income, further reducing the contribution to net income. Third, transportation costs to and from drills must also be subtracted from net income. Taking these factors into account, the average reservist's first-term net reserve income will amount to approximately 55 percent of gross reserve income. See Burright, Grissmer, and Doering (1982).

[14]Grissmer and Kirby (forthcoming) show that for a typical reservist, the probability of a major change in marital status, employment status, and/or residence location is very high during the first term.

[15]Guard nonprior service enlistees began AFEES processing in FY85.

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